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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/051,639	01/18/2002	Craig T. Salling	TI-32536	8729

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TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

LANDAU, MATTHEW C

ART UNIT PAPER NUMBER

2815

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/051,639

Applicant(s)

SALLING ET AL.

Examiner

Matthew Landau

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-- Th MAILING DATE of this communication appears on the cover sheet with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 9-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 19 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION***Election/Restrictions***

Applicant's election of Group I in Paper No. 6 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 9-18 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Claim Objections

Claim 1 is objected to because of the following informalities: There is insufficient antecedent basis for the following limitations in the claim: "the surface", "said surface", "~~said~~ wells", "~~the base~~", "^{the distance}~~the proximity~~", "said buried layer junction", "the remainder", "~~the base and emitter portions~~", and "the depth". The examiner also objects to the phrase "suitable as".
^{"said surface regions"}

In regards to claims 3 and 6, there is insufficient antecedent basis for "the resistivity range".

In regards to claim 8, there is insufficient antecedent basis for "said surface" and "said electrical isolation regions". Furthermore, the limitation "said buried layer has a boundary closest to said surface of less than said barrier depth" is unclear. It is suggested the claim be changed to read "said buried layer has a boundary closest to said surface, wherein said boundary

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has a depth [of] less than said barrier depth". For the purposes of this Office Action, the claim will be treated as if the suggested changes have been incorporated.

In regards to claim 19, there is insufficient antecedent basis for the following limitations in the claim: "the pad", "the base", and "the trigger".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-8, and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In regards to claim 1, it is unclear how a single well can surround the first and second regions. ~~(Also, the limitation "providing a width controlled by the proximity of said buried layer junction to said surface" renders the claim indefinite. It is unclear how the proximity of the buried layer to the surface controls the width of the subsurface band. It should also be noted that this appears to be a process limitation. Furthermore, it is unclear how the layer electrically isolates the base and emitter portions. It is also unclear what is meant by the limitation "said layer extending vertically from said surface regions". Does this mean the layer is in contact with the surface regions?)~~ *Maintain, refine.*

*Add new 112,
cite references. Done.*

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Voldman.

In regards to claim 1, as best the examiner can ascertain the claimed invention, Figure 1 of Voldman discloses an integrated circuit fabricated in semiconductor material 34 of a first conductivity type, said circuit having at the surface at least one vertical bipolar transistor surrounded at least in part by a dielectric isolation zone 13/28, comprising: a first surface region 18 of opposite conductivity type, suitable as an emitter; a second surface region 16 of said first conductivity type, suitable as a base contact; a well 26 of opposite conductivity type surrounding said first and second surface regions, extending from said surface deep into said semiconductor material of said first conductivity type; a layer 30 of said opposite conductivity type buried in said semiconductor material of said first conductivity type, suitable as a collector of said transistor having sharp junctions; a subsurface semiconductor band 20 of said first conductivity type between said layer and said surface and surrounded by said well, said band suitable as the base of said transistor providing a width controlled by the proximity of said buried layer junction to said surface, and a resistivity higher than the remainder of said semiconductor material; said layer extending laterally to said well, thereby electrically isolating the base and emitter portions

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of said transistor from the remainder of said semiconductor material; and said layer extending vertically from said surface regions, beginning at a level more shallow than a depth of said dielectric isolation zone and extending to a depth greater than the depth of said dielectric zone.

The intended use limitation “thereby enabling said vertical bipolar transistor to operate as a low breakdown voltage transistor for low ESD clamping voltage and high beta” does not structurally distinguish the claimed invention over the prior art. Note that Voldman disclose the layer 30 is formed by implantation into the substrate (semiconductor material) 34 (column 3, lines 64 and 65). The subsurface band 20 will have a higher resistivity than the remainder of said semiconductor material as a result of this process.

In regards to claim 2, Voldman discloses said semiconductor material is silicon germanium (column 3, lines 30-33).

In regards to claim 19, Figure 1 of Voldman discloses an electrical connection of the emitter to the pad to be protected against ESD failure, of the base to the trigger circuit or Vss, and of the collector and well of the opposite conductivity type to Vss.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voldman in view of De Jong et al. (US Pat. 5,006,476, hereinafter De Jong).

In regards to claims 3 and 6, Figure 1 of Voldman discloses the semiconductor material of the first conductivity type is p-type and the emitter 18 and buried collector 30 are n-type. The difference between Voldman and the claimed invention is the semiconductor, emitter, and collector are made of silicon, and the resistivity of the semiconductor is from about 1 to 50 ohm-cm. Figure 1n of De Jong discloses an integrated circuit fabricated in a p-type silicon substrate 10, with a vertical bipolar transistor including an n-type silicon emitter 46 and an n-type silicon collector 12, wherein the resistivity of the substrate 10 is 15 - 25 ohm-cm. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Voldman by using silicon, with a resistivity of 15 - 25 ohm-cm, for the semiconductor material. The ordinary artisan would have been motivated to modify Voldman in the manner described above for the purpose of using a well known, inexpensive semiconductor material.

Claims 5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voldman in view of K.O. Kenneth et al. (US Pat. 5,028,977, hereinafter Kenneth).

In regards to claim 5, the difference between Voldman and the claimed invention is the semiconductor of the first conductivity type has a dopant species selected from a group consisting of boron, aluminum, gallium, and indium, while said regions of opposite conductivity type have a dopant species selected from a group consisting of arsenic, phosphorous, antimony, and bismuth. Figure Voldman discloses the first conductivity type is p-type. Kenneth discloses

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boron is used as a dopant for a p-type layer 24 (column 5, lines 24-27). Kenneth further discloses arsenic is used as a dopant for an n-type layer 14 (column 4, lines 43-46). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Voldman by using boron to generate the first conductivity type layers and arsenic to generate the opposite conductivity type layers. The ordinary artisan would have been motivated to modify Voldman in the manner described above for the purpose of using a dopant that is well known in the art.

In regards to claim 7, the difference between Voldman and the claimed invention is the semiconductor of the first conductivity type has a dopant species selected from a group consisting of arsenic, phosphorous, antimony, bismuth, and lithium, while said regions of opposite conductivity type have a dopant species selected from a group consisting of boron, aluminum, gallium, indium, and lithium. Voldman discloses the first conductivity type can be n-type (column 3, lines 40-44). Kenneth discloses arsenic is used as a dopant for an n-type layer 14 (column 4, lines 43-46). Kenneth further discloses boron is used as a dopant for a p-type layer 24 (column 5, lines 24-27). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Voldman by using arsenic to generate the first conductivity type layers and boron to generate the opposite conductivity type layers. The ordinary artisan would have been motivated to modify Voldman in the manner described above for the purpose of using a dopant that is well known in the art.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Voldman in view of Smayling et al. (US Pat. 5,204,541, hereinafter Smayling).

The difference between Voldman and the claimed invention is the semiconductor of the first conductivity type is an epitaxial layer. Figure 7g of Smayling discloses an epitaxial layer 401 on a substrate. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Voldman by using an epitaxial layer as the semiconductor for the purpose of providing a smooth surface on which to fabricate subsequent layers.

Allowable Subject Matter

Claim 8 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record, either singularly or in combination, does not disclose or suggest at least the isolation regions having a depth of 300 to 400 microns and the buried layer having a boundary closest to said surface, wherein said boundary has a depth less than said barrier depth.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (703) 305-4396.

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The examiner can normally be reached from 8:00 AM-4: 30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Matthew C. Landau

Examiner

March 21, 2003